A Monolithic, Non-Field-Widened Spatial Heterodyne Spectrometer for Solar System Exploration, Phase I

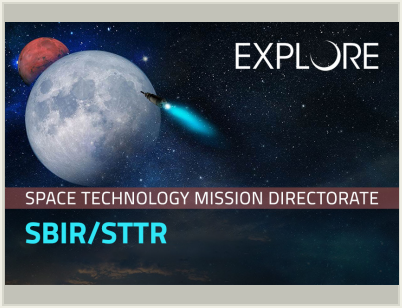
Completed Technology Project (2005 - 2005)

Project Introduction

The goal of this project is to produce a monolithic Spatial Heterodyne Spectrometer (a Fourier Transform Interferometer) for use in Solar System exploration. In Phase I, the gratings and beamsplitter for a visible-wavelength SHS (operating near 633 nm) will be constructed and aligned, to demonstrate that an isomorphic IR monolith can function. A complete IR monolith, with novel construction, will follow in Phase II. The viability of both the Phase I and Phase II constructs will be shown by detecting and analyzing interferograms for a monochromatic and a polychromatic source. The analysis of that data will use Fourier Transform code written by the experimenters in Interactive Data Language (IDL). It is expected that, in each phase, complete spectra of both sources over the spectral range of the instrument will be readily obtained from these tests. The Phase II instrument will be available for further research

Anticipated Benefits

The monolithic SHS is potentially a competitor to the FTIR or echelle-class spectrometers now used for environmental chemical detection and sensing. It also can bring the advantages of interferometry (in terms of improved throughput and compactness) to realms such as computer-card-based spectroscopy, where grating spectrometers are now used. These computer cards, featuring miniature spectrometers built directly onto their surface, are used in tasks ranging from diagnostic testing to portable spectroscopy to educational demonstrations and labs. A small monolithic SHS would make this device significantly faster and more efficient. The SHS is far more robust than conventional interferometers, making it the ideal interferometer for space-based applications. The missions of the Mars Exploration and New Frontiers Programs ? particularly the latter's Venus In Situ Explorer and Jupiter Polar Orbiter ? would be fertile ground for the monolithic SHS. A SHS monolith would also mesh strongly with the Comet Surface Sample Return mission. As the Solar System is explored, remote sensing of planetary, satellite, and cometary atmospheres and ionospheres will become very important. The SHS is extremely well-suited to these missions of the coming decades.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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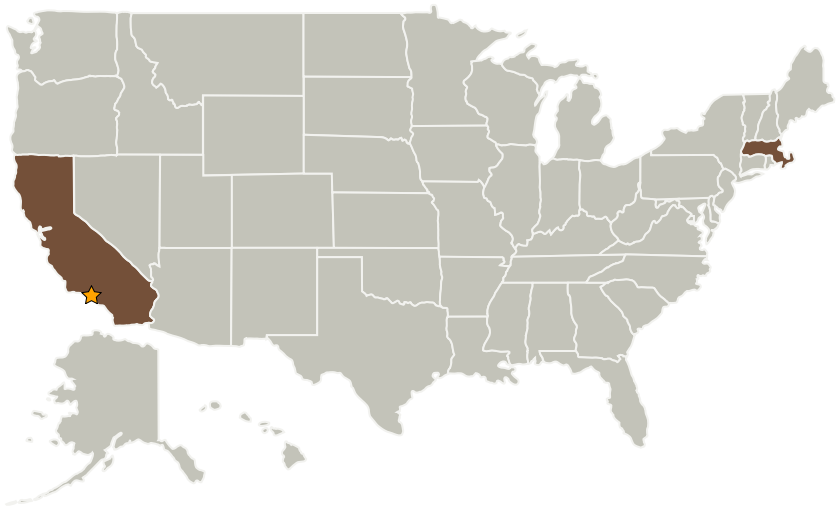
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Scientific Solutions	Supporting Organization	Industry	North Chelmsford, Massachusetts

Primary U.S. Work Locations	
California	Massachusetts

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Project Manager:
Celestino Jun Rosca

Principal Investigator:
Steven R Watchorn

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.2 Heat Sources